# Claims

[c1]     1. An emission control system for controlling NOx and $NH_3$ emissions from an exhaust stream, the system comprising:
a lean NOx trap in communication with the exhaust stream for reducing NOx emissions; and
a $NH_3$ –SCR catalyst in communication with the exhaust stream for adsorbing $NH_3$, wherein the $NH_3$ adsorbed by the $NH_3$ –SCR catalyst reacts with NOx in the exhaust stream to improve the reduction of NOx and $NH_3$.

[c2]     2. The emission control system of claim 1, wherein one or more alternating layers of the lean NOx trap and $NH_3$ –SCR catalyst are provided in a single catalytic converter shell.

[c3]     3. The emission control system of claim 1, wherein one or more alternating layers of the lean NOx trap and $NH_3$ –SCR catalyst are provided in a single substrate.

[c4]     4. The emission control system of claim 1, wherein one or more alternating zones of the lean NOx trap and $NH_3$ –SCR catalyst are provided in a single catalytic converter shell.

[c5]     5. The emission control system of claim 4, wherein each alternating zone of the lean NOx trap and alternating zone of the $NH_3$ –SCR catalyst have a 1" length and 1" width.

[c6]     6. The emission control system of claim 4, wherein each alternating zone of the lean NOx trap and alternating zone of the $NH_3$ –SCR catalyst have a ½ " length and a width of ½ ".

[c7]     7. The emission control system of claim 4, wherein each alternating zone of the lean NOx trap and alternating zone of the $NH_3$ –SCR catalyst have a length of ¼ " and a width of ¼ ".

[c8]     8. The emission control system of claim 1, wherein one or more alternating zones of the lean NOx trap and $NH_3$ –SCR catalyst are provided in a single substrate.

[c9]    9. The emission control system of claim 1, wherein the lean NOx trap generates a sufficient quantity of $NH_3$ to force the reaction between NOx and $NH_3$, whereby $NH_3$ emissions are eliminated and net NOx conversion improved.

[c10]   10. The emission control system of claim 1, wherein the lean NOx trap is optimized for $NH_3$ generation by removing oxygen storage capacity of the lean NOx trap.

[c11]   11. The emission control system of claim 1, wherein the lean NOx trap comprises a precious metal selected from the group consisting of platinum, palladium, rhodium and combinations thereof; and a NOx storage material selected from the group consisting of alkali metals, alkali earth metals, rare earth metals and combinations thereof.

[c12]   12. The emission control system of claim 1, wherein the lean NOx trap comprises platinum.

[c13]   13. The emission control system of claim 1, wherein the lean NOx trap comprises a composite of cerium and zirconium.

[c14]   14. The emission control system of claim 1, wherein the lean NOx trap comprises one or more materials for $NH_3$ generating and NOx storage.

[c15]   15. The emission control system of claim 1, wherein the $NH_3$-SCR catalyst comprises one or more $NH_3$ adsorbing materials, wherein the $NH_3$ adsorbing materials are capable of converting NOx and $NH_3$ to nitrogen.

[c16]   16. The emission control system of claim 1, wherein the $NH_3$-SCR catalyst comprises a base metal and a support selected from the group consisting of alumina, silica titania, zeolite and their combinations.

[c17]   17. The emission control system of claim 1, wherein the $NH_3$-SCR catalyst comprises a metal selected from the group consisting of Cu, Fe and Ce and a zeolite.

[c18]   18. The emission control system of claim 1, wherein the lean NOx trap and $NH_3$-SCR catalyst are placed in a single catalytic converter shell.

[c19]     19. The emission control system of claim 1, wherein the $NH_3$ –SCR catalyst is

separate from and downstream from the lean NOx trap.

[c20]     20. An emission control system for controlling NOx and $NH_3$ emissions from

an exhaust stream produced by the combination of an air/fuel mixture in an

internal combustion engine, the system comprising:

a lean NOx trap in communication with the exhaust stream for NOx reduction

wherein the lean NOx trap comprises a lean NOx trap formulation which

includes one or more NOx storage and $NH_3$ generating materials;

a $NH_3$ –SCR catalyst in communication with the exhaust stream for adsorbing

$NH_3$, wherein the $NH_3$ –SCR catalyst comprises a $NH_3$ –SCR catalyst

formulation which includes one or more $NH_3$ adsorbing materials; and

wherein the lean NOx trap formulation and the $NH_3$ –SCR catalyst formulation

are placed on one substrate.

[c21]     21. The emission control system of claim 20, wherein a layer of the lean NOx

trap formulation and a layer of the $NH_3$ –SCR catalyst formulation are placed on

the substrate to form a two–layer washcoat.

[c22]     22. The emission control system of claim 20, wherein the lean NOx trap

formulation and the $NH_3$ –SCR catalyst formulation are homogeneously mixed

to form a single washcoat layer on the substrate.

[c23]     23. The emission control system of claim 20, wherein the lean NOx trap

formulation and the $NH_3$ –SCR catalyst formulation are heterogeneously mixed

to form a single washcoat layer on the substrate.

[c24]

24. An emission control system for controlling NOx and $NH_3$ emissions from

an exhaust stream produced by the combination of an air/fuel mixture in an

internal combustion engine, the system comprising:

a lean NOx trap in communication with the exhaust stream;

a $NH_3$ –SCR catalyst in communication with the exhaust stream for adsorbing

$NH_3$, wherein the $NH_3$ adsorbed by the $NH_3$ –SCR catalyst reacts with NOx in

the exhaust stream to improve NOx and $NH_3$ reduction; and

wherein the lean NOx trap and $NH_3$ –SCR catalyst are provided in one

substrate.

[c25]    25. The emission control system of claim 24, wherein one or more alternating zones of the lean NOx trap and $NH_3$ –SCR catalyst are provided, each zone having a 1" width.

[c26]    26. The emission control system of claim 24, wherein alternating zones of the lean NOx trap and $NH_3$ –SCR catalyst are provided, each zone having a ½ " width.

[c27]    27. The emission control system of claim 24, wherein alternating zones of the lean NOx trap and $NH_3$ –SCR catalyst are provided, each zone having a ¼ " width.

[c28]    28. The emission control system of claim 24, wherein the lean NOx trap and the $NH_3$ SCR catalyst are placed in one or more alternating layers in the substrate.

[c29]    29. An emission control system for controlling NOx and $NH_3$ emissions from an exhaust stream produced by the combination of an air/fuel mixture in an internal combustion engine, the system comprising:
a lean NOx trap in communication with the exhaust stream;
a $NH_3$ –SCR catalyst in communication with the exhaust stream for adsorbing $NH_3$ , wherein the $NH_3$ adsorbed by the $NH_3$ –SCR catalyst reacts with NOx in the exhaust stream to improve NOx and $NH_3$ reduction; and
wherein the lean NOx trap and $NH_3$ –SCR catalyst are provided in a single catalytic converter shell.

[c30]    30. An emission control system for controlling NOx and $NH_3$ emissions from an exhaust stream produced by the combination of an air/fuel mixture in an internal combustion engine, the system comprising:
a lean NOx trap in communication with the exhaust stream for NOx reduction, to provide a NOx reducing exhaust stream including NOx and $NH_3$ ; and
a $NH_3$ –SCR catalyst in communication with the exhaust stream for adsorbing $NH_3$ , wherein the $NH_3$ adsorbed by the $NH_3$ –SCR catalyst reacts with NOx in the NOx reduced exhaust stream to improve the reduction of NOx and $NH_3$ .

[c31]    31. The emission control system of claim 30, wherein the lean NOx trap generates a sufficient quantity of $NH_3$ to force the reaction between NOx and $NH_3$, whereby $NH_3$ emissions are eliminated and net NOx conversion improved.

[c32]    32. The emission control system of claim 30, wherein the lean NOx trap is optimized for $NH_3$ generation by removing oxygen storage capacity.

[c33]    33. The emission control system of claim 30, wherein the lean NOx trap comprises a precious metal selected from the group consisting of platinum, palladium, rhodium and combinations thereof; and a NOx storage material selected from the group consisting of alkali metals, alkali earth metals, rare earth metals and combinations thereof.

[c34]    34. The emission control system of claim 30, wherein the lean NOx trap comprises platinum.

[c35]    35. The emission control system of claim 30, wherein the lean NOx trap comprises a composite of cerium and zirconium.

[c36]    36. A method of controlling NOx and $NH_3$ emissions from an exhaust stream produced by the combination of an air-fuel mixture in an internal combustion engine, comprising:
a lean NOx trap in communication with the exhaust stream; and
providing an $NH_3$-SCR catalyst in communication with the exhaust stream for adsorbing $NH_3$, wherein the $NH_3$ adsorbed by the $NH_3$-SCR catalyst reacts with NOx in the exhaust stream.

[c37]    37. A catalyst system for controlling diesel particulates, comprising:
a porous substrate, including a washcoat containing lean NOx trap and $NH_3$-SCR catalyst formulations, wherein the porous substrate filters diesel particulates.

[c38]    38. A method of controlling diesel particulates from a diesel exhaust stream comprising:
providing a porous substrate;

incorporating a washcoat comprising lean NOx trap and $NH_3$ –SCR formulations into the porous substrate; and

passing the diesel exhaust stream through the porous substrate to filter diesel particulates.

[c39] 39. An emission control system for controlling NOx and $NH_3$ emissions from an exhaust stream produced by the combination of an air/fuel mixture in an internal combustion engine, the system comprising:

a three–way catalyst in communication with the exhaust stream to reduce NOx emissions and produce $NH_3$ , wherein the three–way catalyst comprises platinum on an outer surface of the three–way catalyst to optimize the formation of $NH_3$ , and wherein the three–way catalyst is further optimized for $NH_3$ generation by removing oxygen storage capacity of the three–way catalyst; and

an $NH_3$ –SCR catalyst in communication with the exhaust stream for adsorbing $NH_3$ , wherein the $NH_3$ adsorbed by the $NH_3$ –SCR catalyst reacts with NOx in the exhaust stream to improve the reduction of NOx and $NH_3$ .